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मानक

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Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 10000-2 (1980): Methods of tests for internal combustion engines, Part 2: Standard reference conditions [TED 2: Automotive Primemovers]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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AMENDMENT NO. 1 MARCH 1985
TO
IS:10000(Part 2)-1980 METHODS OF TESTS FOR INTERNAL
COMBUSTION ENGINES
PART 2 STANDARD REFERENCE CONDITIONS

[*Page 1, clause 3, item (d)*] - Substitute
'42 000 kJ/kg' for '42 800 kJ'.

(EDC 14)

Reprography Unit, BIS, New Delhi, India

Indian Standard

METHODS OF TESTS FOR
INTERNAL COMBUSTION ENGINES

PART II STANDARD REFERENCE CONDITIONS

1. Scope — Specifies the standard reference conditions for the purpose of determining the power and fuel consumption of constant speed and variable speed engines.

2. Section I — Standard Reference Conditions for Constant Speed Engines

- | | |
|---|-----------------------|
| a) Mean barometric pressure | 100 kPa (750 mm Hg) |
| b) Atmospheric temperature
(air-temperature) | 300 K (27°C) |

Note — Intake air temperature shall be measured at a distance of 150 mm from the air intake. If a filter is provided, the temperature shall be measured at a distance of 150 mm from the filter. Where air intake into the filter is from various directions, the mean of four readings taken from diametrically opposite points, at equal distances, shall be used. It shall be measured by a thermometer shielded from radiant heat.

- | | |
|--|---|
| c) Relative humidity | 60 percent at 300 K (27°C) [Corresponding to a water vapour pressure of 2.133 kPa (16 mm Hg)] |
| d) Charge air coolant temperature
(wherever applicable) | 300 K or 350 K (to be stated) (27°C or 77°C) |
| e) Intake air depression and
exhaust back pressure | Equal to that obtained with intake and exhaust systems normally fitted to the engine or recommended by the manufacturers. However, it shall not exceed 50 mm of water unless the manufacturer has accepted higher back pressure prior to test |

- | | |
|----------------|--|
| f) Auxiliaries | The engine shall be equipped with all the dependent essential auxiliaries as defined in IS : 10000 (Part I)-1980 ' Methods of tests for internal combustion engines: Part I Glossary of terms relating to test methods ' |
|----------------|--|

3. Section II — Standard Reference Conditions for Variable Speed Engines

- | | |
|--|---|
| a) Mean barometric pressure | 100 kPa (750 mmHg) |
| b) Air inlet temperature | 300 K (27°C) |
| c) Test bed exhaust extraction
pressure (depression in mm
of water) | Less than 50 mm of water at the end of tail pipe |
| d) Fuel | Net calorific value of fuel used shall be 42 800 kJ (10 030 kcal/kg) [see IS : 1460-1974 Specification for diesel fuels (second revision) and IS : 2796-1971 Specification for motor gasoline (first revision)] |
| e) Fuel supply system | Head not greater than 2 metres (for engines without fuel pump) |
| f) Fuel injection equipment | Set before test to the setting specified by the manufacturer. The maximum fuel delivery stop shall be permanently locked |
| g) Governor | Set as per manufacturer's specification during running-in |
| h) Lubrication system | Engine manufacturers' system at operating pressure with additional cooling if required, to compensate for absence of air flow caused by motion of the vehicle |

Note 1 — The effects of humidity are neglected, hence it is not mentioned.

Note 2 — The use of smoke suppressant additives in the fuel is not permitted for testing.

Note 3 — A list of equipment which should be fitted during testing is given in Appendix A.

Adopted 7 July 1980

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APPENDIX A

(Clause 3)

INSTALLATION OF AUXILIARIES DURING TEST FOR
DETERMINATION OF NET POWER

No	Auxiliaries	Fitted for Net Power Test
1	<i>Intake system</i> Intake manifold Air filter Intake silencer (if fitted) Crankcase emission control system (if fitted) Speed limiting device (if fitted)	Yes standard production equipment
2	<i>Induction heating device of intake manifold (if fitted)</i>	Yes, standard production equipment if possible to be set in the most favourable condition
3	<i>Exhaust system</i> Exhaust purifier (if fitted) Manifold Connecting pipes* (if fitted) Silencer* (if fitted) Tail pipe* (if fitted) Exhaust bracket (if fitted)	Yes standard production equipment
4	<i>Fuel supply pump†</i>	Yes standard production equipment
5	<i>Carburettor (if fitted)</i>	Yes, standard production equipment
6	<i>Fuel injection equipment (petrol and diesel)</i> Prefilter (if fitted) Filter Pump High pressure pipe (if fitted) Injector Air intake valve§ (if fitted) Governor (if fitted)	Yes, standard production equipment

*If it is impracticable to fit the standard exhaust system a system of equivalent restriction may be fitted for the test, provided that this is acceptable to the manufacturer

In the test laboratory, the exhaust extraction system at the point where the test bed exhaust system is connected shall not, with the engine in operation create at the exhaust extraction duct a pressure of more than 50 mm of water [see 3(c)] unless the manufacturer has accepted a higher back pressure prior to the test

†If an exhaust brake is incorporated in the engine the throttle valve may be removed or fixed in the fully open position.

‡The fuel feed pressure may be adjusted if necessary, to reproduce pressure existing in the particular engine application (particularly where a ' fuel return ' system is used) [see 3(c) for systems without fuel feed pump]

§The air intake valve is the control valve for the pneumatic governor of the injection pump

No.	Auxiliaries	Fitted for Net Power Test
7	<i>Liquid cooling equipment:</i> Engine bonnet Bonnet air outlet	No
	Radiator* (if fitted) Fan†† Fan cowl Water pump Thermostat‡	Yes*, standard production equipment
8	<i>Air cooling:</i> Cowl Fan††	Yes, standard production equipment
	Auxiliary test bed fan	Yes, if necessary
	Temperature regulating device	Yes, standard production equipment
9	<i>Electrical equipment</i>	Yes , standard production equipment
10	<i>Supercharging equipment (If fitted):</i> Compressor, driven either directly or indirectly by the engine, and/or by the exhaust gases Intercooler¶ Coolant pump or fan (engine driven) Coolant flow control device (if fitted)	Yes, standard production equipment
	Auxiliary test bed fan	Yes, if necessary
11	<i>Anti-pollution devices (If fitted)</i>	Yes, standard production equipment

*The fan, the water pump and the thermostat shall be located on the test bed in the same relative positions that they will occupy on the vehicle. The cooling liquid circulation shall be by the engine water pump only.

Cooling may be produced either by the engine radiator or by an external circuit, provided that the pressure loss of this circuit remains substantially the same as that of the engine cooling system. The radiator shutter, if incorporated, shall be in the open position.

†Where a disconnectable fan is incorporated, the net power shall be determined firstly with the fan disconnected, then with the fan connected.

††Where a fixed fan, electrically or mechanically operated, cannot be fitted on the test bed, the power absorbed by the fan should be determined at the same engine speeds as those used for the measurement of the engine power. This power shall be deducted from the corrected power to obtain the net power.

‡The thermostat may be fixed in the fully open position.

||Minimum power of the generator — The power of the generator shall be limited to that necessary for the operation of accessories which are indispensable for the operation of the engine. There shall be no charging of the battery during the test.

¶The temperature of the air at the inlet manifold shall be that specified by the engine manufacturer, if such a specification is given.

EXPLANATORY NOTE

The testing and performance of constant speed and variable speed internal combustion engines was earlier covered by the following Indian Standards

- IS 1600-1960 'Code for type testing of constant speed internal combustion engines for general purposes',
- IS 1601 1960 'Performance of constant speed internal combustion engines for general purposes',
- IS 1602-1960 'Code for type testing of variable speed internal combustion engines for automotive purposes', and
- IS 1603 1960 'Performance of variable speed internal combustion engines for automotive purposes'.

These standards were originally issued in the year 1960 and as a result of implementation of these standards by the manufacturers of engines and testing laboratories, as also the operation of ISI Certification Marking Scheme, these standards have now been extensively revised

While IS 1600 and IS 1602 covered the codes for type testing of constant and variable speed engines respectively, the performance requirements of such engines were covered by IS 1601 and IS 1603 respectively. These standards are replaced by two sets of standards, one set covers the methods of testing of engines and the other covers the specification and performance requirements of both constant speed and variable speed engines

The standard covering methods of tests is being published in following 12 parts (each part covering a particular test method or information related to methods of tests)

- IS 10000 Part I Glossary of terms relating to test methods
- IS 10000 Part II Standard reference conditions
- IS 10000 Part III Measurements for testing — units and limits of accuracy
- IS 10000 Part IV Declarations of power, efficiency, fuel consumption and lubricating oil consumption
- IS 10000 Part V Preparation for tests and measurements for wear
- IS 10000 Part VI Recording of test results
- IS 10000 Part VII Governing tests for constant speed engines and selection of engines for use with electrical generators
- IS 10000 Part VIII Performance tests
- IS 10000 Part IX Endurance tests
- IS 10000 Part X Tests for smoke level, limits and corrections for smoke levels for variable speed engines
- IS 10000 Part XI Information required with inquiry or order and information supplied by the manufacturer with the engine
- IS 10000 Part XII Test certificates

This standard will be complementary to specifications for performance requirements of different types of engines covered by following standards

- IS 10001 Specification for performance requirements for constant speed compression ignition (diesel) engines for general purposes (up to 20 kW)
- IS 10002 Specification for performance requirements for constant speed compression ignition (diesel) engines for general purposes (above 20 kW)
- IS 10003 Specification for performance requirements for variable speed compression ignition (diesel) engines for automotive purposes
- IS 10004 Specification for performance requirements for variable speed spark ignition engines for automotive purposes

Spark ignition engines for sprayers and similar applications have been covered by IS 7347-1974 Specification for performance requirements of small size spark ignition engines for sprayers and similar applications

Two stroke spark ignition engines for automotive applications which were earlier covered by IS 1603 will be covered by a separate specification

The revised methods of tests covered by IS : 10000 (Part I to Part XII) have been aligned with the current international practices in the field of I. C. engines. These parts are in general agreement with the following ISO standards, issued by the International Organization for Standardization:

- a) ISO 3046/I-1975 Reciprocating internal combustion engines — Performance: Part I
Standard reference conditions and declarations of power, fuel
consumption and lubricating oil consumption
- b) ISO 3046/II-1977 Reciprocating internal combustion engines — Performance: Part II
Test methods
- c) ISO 3046/III-1979 Reciprocating internal combustion engines — Performance: Part III
Test measurements
- d) ISO 2710-1978 Reciprocating internal combustion engines — Vocabulary

Standard reference conditions pertaining to constant speed engines covered by Section I of this standard are in agreement with ISO 3046/I-1975 issued by the technical committee ISO/TC 70- Internal combustion engines of the ISO. However, the standard reference conditions for variable speed engines covered by Section II of this standard differ from those, given in ISO 1585-1974 ' Road vehicles — Engine test code — ' Net power ' issued by the technical committee ISO/TC 22 Road Vehicles of the ISO for temperature and relative humidity. These reference conditions are same as given in Section I, except that the effect of humidity on power and fuel consumption for variable speed engines is neglected, being insignificant. The accessories required to be fitted for determining ' net power ' are in agreement with ISO 1585-1974.

IS : 10000 (Part I to Part XII) and IS : 10001, IS : 10002, IS : 10003 and IS : 10004 collectively supersede IS : 1600, IS : 1601, IS : 1602 and IS : 1603.